Bioenergy Farm II project: Economics of biogas production in micro-installations in selected EU countries

Sopegno, A.[1], Busato, P.[1], Cornelissen, R.[2], Berruto, R.[1]

[1] *University of Torino, Department of Agricultural, Forest and Food Sciences. Largo Paolo Braccini, 2, 10095 Grugliasco (TO), Italy*

[2] *CCS Energy Consulting, Postbus 780, 7400 AT Deventer, The Netherlands*

e-mail of the corresponding author: alessandro.sopegno@unito.it

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INTRODUCTION

The issue of profitability of agricultural biogas production has been a subject of economic analyses in different countries. Recently, detailed financial analysis for large biogas plants in Italy has been prepared by (Iotti and Bonazzi 2016). Some issues related to the economic determinants of agricultural biogas production were taken into account in opinion survey carried out by (Tersbøl and Malm 2013) among farmers from a few countries. Also (Karlsson et al. 2017) were searching the determinants of the development of agricultural biogas market in Sweden. The conclusions pointed out that one of the key success factor is long-term perspective and taking into account not only economic benefits but also social and environmental advantages.

In recent times an increasing interest in the problems of profitability of agricultural biogas production has been observed, however majority of the economic analyzes (IRENA 2018; LAZARD 2014; KOST et al. 2013) have focused mainly on comparisons of different technology while the farmer's point of view has been rather ignored. So far, also comparisons of the profitability of agricultural biogas production at the farm level across countries were also not available.

MATERIALS AND METHODS

In the Bioenergy Farm II project, the main source of data for the analysis was the "Micro-scale digestion calculation tool" developed for the Bioenergy Farm II project, in a cooperation between DISAFA, University of Turin and CCS. The tool allows to assess profitability of investments in agricultural biogas plants based on detailed, climatic, region and farm specific technological and economic parameters (De Jong 2015; Busato et al. 2014).

Seven EU countries were covered by the study: Belgium, Denmark, France, Germany, Italy, the Netherlands and Poland, for a total of 802 business plan made on real farms collected. In 97.5% of all feasibility studies cogeneration was considered, and only 2.5% of farmers chose the biomethane scenario. Because of the small number of observations for biomethane scenario this paper is focused on CHP scenario only.

RESULTS AND DISCUSSION

Feasibility studies prepared with the "Micro-scale digestion calculation tool" provided data allowing to assess the economic viability of the investments in agricultural micro-scale biogas installations. Table 1 summarizes the data on the simple payback period. On average, across the entire population of holdings in all countries considered in the study, about 36% of investments were financially not feasible (all farms in the Polish sample, 40,9% in Italy).

The payback period less than 20 years was achieved in the 64% of the business plan made, of which the period less than 8 years was achieved in 31,4% of cases. The share of financially viable investments varies between the countries – the highest was noted in France (95%) and Belgium (93,7%), followed by Denmark (92,5%). The number of investments with a positive return in the period less than 8 years was the highest Denmark (54,7%) and France (50,5%), followed by Belgium (47,9%).

In the Polish sample of farms all business plans indicated the lack of profitability. This demonstrates importance of subsidies for the development of micro-scale farm biogas plants.

	ALL	BE	DK	FR	DE	IT	NL	PL
total BP (n)	802	142	53	101	60	186	128	132
not feasible BP (%)	36,0%	6,3%	7,5%	5,0%	28,3%	40,9%	35,9%	100,0%
BP with payback <=20 years (%)	64,0%	93,7%	92,5%	95,0%	71,7%	59,1%	64,1%	0,0%
BP with payback <=8 years (%)	31,4%	47,9%	54,7%	50,5%	8,3%	29,6%	34,4%	0,0%

Tab. 1: Simple payback period in different countries considering the business plan (BP) elaborated

The average investment costs vary significantly between countries, the average was 8155 EUR/kWe, considering we speak about plant with below 300 kWe installed power.

CONCLUSION

The analysis showed that many projects of agricultural micro-biogas plants are characterized by a very long payback time, what means that they are totally unattractive from the point of view of investors (farmers).

Taking into account that the climate and the quality of the natural environment are public goods, the EU countries should provide either simple regulations or subsidies to impact positively the farmers and the environment through implementation of new, micro-scale anaerobic digestion plants.

REFERENCES

Busato, P., Sopegno, A., Berruto, R. and Cornelissen, R., 2014. An on-line advisor for sizing and economic analysis of anaerobic digestion plants. *Agricultural Engineering International: CIGR Journal*, 16(1), pp.319–327.

Iotti, M. and Bonazzi, G., 2016. Assessment of biogas plant firms by application of annual accounts and financial data analysis approach. *Energies*, 9(9), p.713.

IRENA, 2018. *Renewable Power Generation Costs in 2017* International Renewable Energy Agency, ed., Abu Dhabi: International Renewable Energy Agency.

De Jong, B., 2015. Quick user guide of the Offline Expert Feasibility Calculator for Small scale Digestion. , p.32.

Karlsson, N.P.E., Halila, F., Mattsson, M. and Hoveskog, M., 2017. Success factors for agricultural biogas production in Sweden: A case study of business model innovation. *Journal of Cleaner Production*, 142, pp.2925–2934.

Kost, c., mayer, j.n., thomsen, j., hartmann, n., senkpiel, c., philipps, s., nold, s., lude, s., saad, n. And schlegl, t., 2013. *Levelized cost of electricity renewable energy technologies*,

Lazard, 2014. *Lazard's levelized cost of energy analysis — version 8.0*,

Tersbøl, M. and Malm, L., 2013. *Financial Performance of Organic Biogas Production*,

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